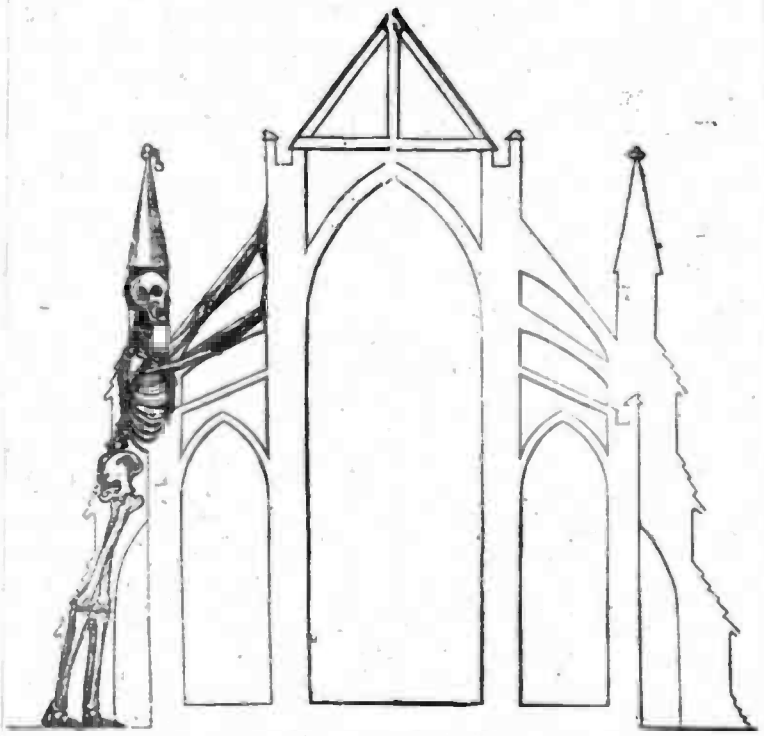
tects, which as he believes it outstrips in combination of skill and beauty, all other efforts of the architectural practitioner, ancient or modern, affords him matter of surprise, that as far as he knows or remembers, it has not been noticed by any previous writer.

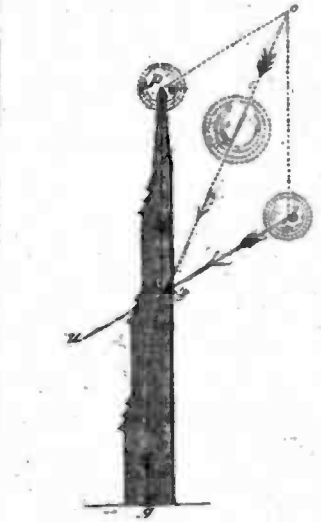


The manner in which the Gothic architects conducted the active force of a vault to one place, and then with practical certainty counter-abutted that force by a small quantity of materials placed exactly in the situation proper for the purpose, has just been shewn: it is now proposed to shew the wonderful manner in which the flying-buttresses, the wall-buttresses from which they spring, and the surmounting pinnacles, are together disposed, so as with the most delicate union of the extreme of beauty, to unite the most wonderful economy and such a knowledge of mechanics as will in vain be sought for in any other description of buildings.

Having found out exactly the precise place where the active force of the vaulting was pressing against the wall, they distended the flying-buttress or arc-boutant widely at that part, in the same manner as a modern carpenter in temporary shoring places a board flat against a dangerous wall; they then gradually concentrated this distention of the wall-thrust into one point, where the flying-buttress joins the wall-buttress: thus they concentrated at the head of the wall-buttress all the active force communicated by the vaulting, in the same manner as in wrestling all the force received by the arms becomes concentrated in the spine, pressing its vertebræ closely together: but then as the operation of this force, would have required the wall-buttress to be made sprawling out to a vast distance from the wall in order to prevent the active power from throwing it over, they changed the course of the active force, simply by running up the head of the wall-buttress in the form of a pinnacle, which having only a direct downward gravity, by the resolution of forces, so changed the course of the active force, that it could be confined within the body of a buttress of comparatively moderate dimensions,—the downwardly-increasing gravity of the wall-buttress in fact mingling with the force communicated to it, curved the direction of the force more and more inwards, till it was eventually rediffused horizontally over the broad foundation of the buttress, and was from thence communicated to the earth itself. Thus pinnacles, which are vulgarly considered merely as ornaments, became the most refined instruments in the economy and security of ecclesiastical and other buildings, and like the position of the human head, had a most material influence upon the stiffness and activity of the whole frame. With this knowledge, it was, that the Gothic architects proportioned the weight and size of their pinnacles, and when we see them assuming an extraordinary altitude, as at Worcester Cathedral, it is not from idle, wild, or luxuriant caprice, but because extraordinary means were required in order to change suddenly the course of an active power, which would otherwise have expended itself beyond the body of the abutment, and by displacing it, have brought to ruin the whole work.*

They did not always stop here, for knowing that there was a portion of the wall-buttress near the ground and adjoining to the side aisles, which received no thrust, and lay as it were dead, this they cut out altogether, as at Gloucester Cathedral, some of our English Chapter-houses, Westminster-hall, and some of the Continental Cathedrals which have chapels set

* Rondelet, in his "Traité Theorique et Pratique de l'Art de Bâtir," shews that he had sagacity enough to find out the beauty of the whole management of the Dome of St. Paul's, and that he saw plainly the consolidating effect which the weight of the covering of the Dome has upon the hollow cone: but it is singular, that this sagacity did not preserve him from in some sort deprecating the oblique meeting of the cone with its supporting piers: he did not perceive, that besides the enormous collection of surrounding abutments which the great cone possesses, the perpendicular extension of the external periphery from above the foot of the cone, acts so as by the resolution of forces to materially change the direction of any expanding thrust which the base of the cone may possess, and to confine it strictly within the bodies of the first set of piers.

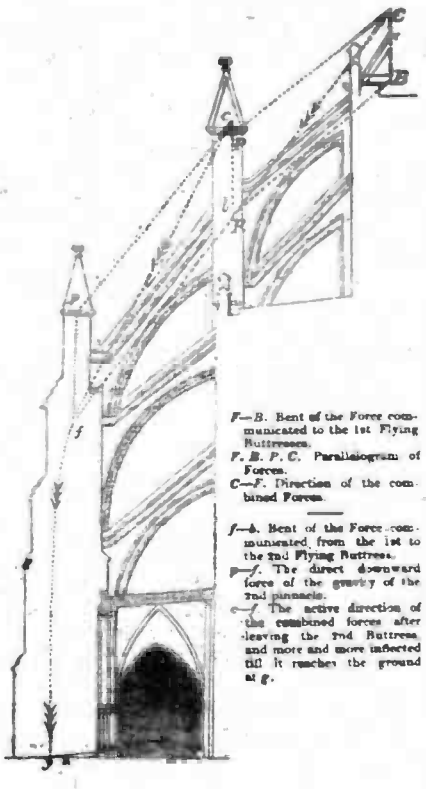


a—*b*. Bent of the force communicated to the flying-buttress by the drift of the vaulting, which force would proceed unrestrained to *a*, if the pinnacle were removed, and would consequently drive over the wall-buttress in that direction.

p—*f*. The direct downward force of the gravity of the pinnacle.

c—*f*. The active direction of the two combined forces above stated; more and more restrained in its downward course, within the body of the wall-buttress, till it reaches the ground at *g*.

f, *b*, *p*, *c*. Parallelogram of forces.



F—*B*. Bent of the Force communicated to the 1st Flying Buttresses.

F, *B*, *P*, *C*. Parallelogram of Forces.

C—*F*. Direction of the combined Forces.

f—*b*. Bent of the Force communicated from the 1st to the 2nd Flying Buttress.

p—*f*. The direct downward force of the gravity of the 2nd pinnacle.

c—*f*. The active direction of the combined forces after leaving the 2nd Buttress, and more and more inflected till it reaches the ground at *g*.

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